PB-230 276

GUIDE FOR PLANNING AND ZONING OFFICIALS IN CONSIDERING ATOMIC ENERGY FACILITY ZONING ACTION

American Standards Association
New York, New York

June 1965

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Proposed American Standard

Guide for Planning and Zoning Officials in Considering Atomic Energy Facility Zoning Action

N-2.5.1 - 1965

TECHNICAL ASSISTANCE BRANCH
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Prepared by

American Standards Association
Section Committee N-2

DRAFT
June 1965

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Preface

As more and more industrial, medical and educational applications are found for atomic energy in the form of nuclear generated heat or electricity, radioactive materials or high intensity radiation sources, buildings to house associated facilities must be built and land for such buildings must be obtained or set aside.

The allocation of land for such use would seem to require that the general objectives of planning and zoning by local agencies be applied. These objectives are primarily to encourage and maintain a satisfactory environment, in which private homes or apartments, light, medium and heavy industry, general commercial business, professional services and educational institutions can be so arranged geographically to minimize interference with each other to the maximum extent possible. The general plan in a community considers not only the present and near future use of land, but should keep in mind major technological developments which like atomic energy, may require some specialized land uses.

The present working draft was developed by Mr. Saul J. Harris, Public Health Service, New York, New York, Project Leader of the ASA N-2.5.1 Project after a series of informal conferences and meetings have been held with representatives of the nuclear industry, government, planning and zoning officials and private consultants and interested individuals. In addition, frequent correspondence with such persons and groups has been most

valuable in attempting to determine the proper approach by planning and zoning boards and officials to the land use requirements of the nuclear industry.

Any comments, suggestions, corrections or additions to this draft will be welcomed and be used as the basis for the organization of a final draft. In all probability, the final draft will be developed by a small working task force under the ASA Subcommittee N-2.5, Model Legislation. Chairman of ASA N-2.5 is Mr. Maurice Axelrad, New York Office of Atomic and Space Development, New York, New York.

Related work on standards for reactor safety, design of radiation and nuclear facilities, testing of nuclear components, radiation protection standards and other aspects of nuclear facility management are in process through other sectional committees of the American Standards Association and professional societies, such as the American Nuclear Society, the ASME and the ASCE.

I. Introduction

a. Purpose

This standard is intended to serve as a guide for industry and planning and zoning officials toward the orderly review of the needs of atomic energy facilities for specific parcels of land such that the use of land by atomic energy installations shall be encouraged for the general welfare and not result in an excessive public health and safety problem.

b. Scope

This standard shall consider the proper use of land by atomic energy facilities, suggest those which may require prior consideration of land use, review the extent to which public health and safety problems may be separately provided for, through means other than planning or zoning, and to offer some recommendations for objective action.

II. Definitions

(To be added as required by final draft.)

engineered safeguards

nuclear reactor (power reactor)

fission products

III. Classification of Atomic Energy Facilities

a. In general, industrial firms engaged in the manufacture of atomic energy products can be classified under those standard industrial codes applicable to non-nuclear products manufacturers. (See Appendix A)

b. Atomic energy facilities may also be classified according to the manner in which the special nuclear material, source material, by-product material or radiation sources are used. For the purposes of this guide, however, such uses may be classified according to whether the use of land by such a facility represents a continuing special land use problem.

c. For the purposes of zoning, atomic energy uses may be arbitrarily separated into those which can utilize an existing building (such as a warehouse, steel mill, classroom or medical office, for example) from those which require the construction of a specialized building or complex of buildings. Such new construction or major modification of an existing structure to convert it to a nuclear facility will require routine review and building permits by local building agencies in accordance with applicable general regulations, codes or standards. The radiation protection aspects of new construction will be subject to review and possibly approval by qualified radiation experts, and either Federal or state licensing agencies. In many instances, atomic energy can be safely put to use in

existing structures with no visible changes in its exterior or even the interior. In this draft of the guide, no separation has been made of atomic energy uses under this possible criteria.

IV. General Planning and Zoning Approaches

a. The application of general planning and zoning authority to atomic energy product manufacturers or atomic energy facilities on the basis of a comprehensive plan shall be considered beyond the scope of this standard. However, certain advantages to the use of atomic energy, in developing a comprehensive plan where environmental health problems such as air and water pollution are intended to be minimized or where central heating systems are proposed, are suggested because of the closed cycle technical nature of the chain reaction process. There may conceivably be sufficient advantages to be gained from the use of atomic generated steam and electricity which would permit major changes in a comprehensive plan.

b. In general, it would appear that the end use of the land by the type of facility would determine its proper classification for planning and zoning purposes. The use of a radioisotope thickness gauge in a paper coating plant does not fundamentally alter the basic end use of the plant property for the purpose of manufacturing coated paper. The manufacture of plate uranium fuel rods is conducted in a metal rolling or fabricating shop not unlike the

rolling or manufacture of non-nuclear materials. A nuclear research reactor on the campus of a university is essentially a research tool and does not affect the use of the land for university activities.

V. Land Use and Atomic Energy Facilities

a. Before any atomic energy facility can be caused to be built or operated and before any radioactive materials can be obtained for use or handling, certain Federal or state health and safety requirements must be met. These licenses are given after the AEC or a state health department has reviewed the plans for the use and qualifications of the user and is convinced the facility can be operated without undue hazards to the health and safety of the public, or insure an acceptable low risk of exposure to the public in the event of an accident.

b. The achieving of adequate radiation protection has been demonstrated to be a matter of proper design of a facility and proper training and operation by radiation workers. Releases of radioactive material into the general environment are subject to control through the application of standards which consider the normal, routine operating situation and the special, sudden accidental release possibility. The actual experience and data as to environmental releases are reviewed by either the AEC or state and local health agencies or both.

c. The relationship between an atomic energy facility use of land and the use of neighboring land for other residential, commercial, educational or industrial purposes is different from other similar non-atomic activities only insofar as the possibility exists for releases of radioactivity into the general environment, beyond the lot line or beyond the control of the nuclear facility's owners. This relationship has been expressed as follows:

"...it is impossible to construct any fully objective, quantitative method for defining a boundary between acceptable sites and those which would be unacceptable."

"...for normal operations, the choice of sites depends primarily on economics, not on safety..."

"...safety, in the case of an accident, depends not only on distances but also on protective features of the facility..."

"...where unfavorable site characteristics exist, the proposed site may nevertheless be found acceptable if the design of the facility includes appropriate and adequate compensating engineered safeguards."

"...confidence ... for the consequences-limiting safeguards must be comparable to that of distance factors which otherwise must be depended on for protection."

The AEC Advisory Committee on Reactor Safeguards indicated that the use of "engineered safeguards" has been proposed "to allow the siting of

reactors at locations where, without such safeguards, protection of the public would not be adequate." The Committee indicated that "the number of sites economically suitable for the location of nuclear power reactors is limited." It added that apart from safety matters, the chief requirements are a sufficient supply of condenser cooling water and location near the demand for electric power. The Committee indicated that "the health and safety of the public are assured if fission products are retained within the reactor or its containment."

The selection of a site for a nuclear power reactor depends in any case upon the combination of engineering design and adequate distances since there are few sites where some engineered safeguards would not be needed or where the advantages of a remote site may be only temporary. The development of industrial growth plus associated commercial and residential growth near an operating nuclear power reactor can be expected to increase the population density, even though the site was originally remote.

d. Although there has been considerable discussion as to selecting the proper sites for nuclear energy electrical generating stations and for industrial and educational research reactors, most of the factors associated with such siting matters are identical with the same factors which would be applicable to plants or research facilities which are non-nuclear. The non-nuclear aspects of even major nuclear energy facilities may be more decisive in terms of the selection of suitable land than

those aspects commonly identified with such facilities. The availability of cooling water, the center of the load demand for electricity and the existence of related research facilities may be examples of these other factors.

e. A fundamental consideration in the case where nuclear energy is used to produce heat to generate electricity (or perhaps desalinate water) is the fact that the nuclear process involves no open combustion and requires little if any additional fuel storage facilities at the generating plant site. In essence, the nuclear energy electrical generating station site would not need to be restricted in terms of the need to provide storage of coal, oil or natural gas nor in terms of the possible soot and noxious fumes in the form of air pollution which might be a nuisance or health hazard to the surrounding community. Not only would conventional fuel storage facilities at the site be negated, but all-weather, continuous transportation facilities for the conventional fuels would not be a factor in selecting a good location.

f. Radioactive wastes from nuclear operations are not permitted to be released to the general environment in excess of allowable concentrations at the location of the facility in which they are produced generally, but are extracted, confined, stored and subsequently transported to a special waste depot or burial ground for final disposition. The use of land for radioactive

waste burial or for long term underground waste storage is in essence a perpetual use and must be so considered. Similarly nuclear fuel removed from a reactor is generally transported intact within large, shielded and cooled, casks either by truck or by rail to facilities where the spent fuel is reprocessed and the fission products and unused fuel are separated. Only at such reprocessing facilities is the integrity of the fuel elements deliberately destroyed and radioactive wastes produced. Such facilities do require associated radioactive waste handling and storage facilities. Operations involving only the collection of packaged, low level radioactive waste for temporary storage and consolidation prior to shipment to permanent disposal sites should be clearly distinguished from operations at locations where the final disposal to ground burial or to long-term liquid tank storage takes place. The use of buildings and land for temporary warehousing of packaged, low-level radioactive wastes should not require special zoning or planning considerations.

g. A few nuclear energy installations do involve the handling of fissionable materials in quantities and forms which could result in enough material being brought together repidly to cause a sudden chain reaction, which is unique to fissionable materials. In this instance, experience has shown that small, low-level explosions can take place which result in radioactive contamination of the

immediate area inside the building and some, short term radioactive contamination of the environment immediately outside the building. In those few instances which have happened, no permanent radioactive contamination has occurred beyond the property line of the installation.

VI. Recommendations

a. It is the sense of this guide that planning and zoning officials should approach the question of approving a site for a nuclear energy application or facility by first ascertaining whether the building of such facilities has been approved in conformity with applicable Federal, state or local health laws. The planning or zoning official should also be certain as to who will determine whether the facility continuously complies with applicable environmental health standards and the competency of the inspection personnel.

b. Planning and zoning officials should obtain direct assurances from owners of nuclear energy facilities that applicable local laws and ordinances will be followed in the construction and operation of the facility. In the event of an emergency, provision should be routinely made to notify state and local police or fire forces and provide the necessary entry to meet the emergency.

c. Planning and zoning officials should consider zoning matters relating to a nuclear energy facility primarily in terms of the end use of the

facility. For example, an industrial plant manufacturing gages in which radionuclides are incorporated should be considered for zoning purpose the same as any plant manufacturing measuring and controlling instruments (SIC 3821).

d. Where zoning action to change existing land use plans to provide property for a major nuclear facility must be taken by planning and zoning officials, the use of a special permit may be recommended. Such special permit requirements should be made conditional for such production and utilization facilities upon obtaining construction and operating permits by the Atomic Energy Commission. The granting of a special permit may include a full review of environmental health factors including, but not limited to radiological health matters, and other regular zoning and planning considerations. The special permit approach should provide for a maximum of exchange of views and technical information on particular construction proposals.

e. Where a specific design for a nuclear power reactor has been approved by the AEC for a particular site because of the inclusion of properly engineered safeguards when such a site would not have otherwise been considered as suitable, planning and zoning officials should give every consideration to permitting the site to be used for the generation of electric power, if zoning action is necessary.

Special permits in such instances may contain provisions that engineered safeguards be maintained and tested in accordance with applicable A.S.A., A.S.M.E., A.N.S. or other national standards.

f. Where long-term storage or essentially perpetual ground burial of liquid or solid radioactive wastes is planned, zoning action, if necessary, should be accomplished through the process of a special permit. The granting of the special permit may include a full review of the current and future environmental health aspects of the site including, but not limited to, radiological health matters.

VII. Performance Standards

a. General

Since many zoning ordinances incorporate performance standards as a means of controlling quality of activities in various zoning districts, it is suggested that radiation standards be adopted for application to radiation installations.

In all instances, atomic energy installations shall conform to building construction performance standards for similar uses. Foundations, containment structures, heavy duty trucking ramps and roadways, materials handling equipment, canals, storage tanks and piping should comply with local codes or, in the absence of such codes, nationally accepted standards for that type of construction.

b. Radiation Exposure Standards

In all districts and in all buildings or other structures, any

use of atomic energy material or radiation sources shall comply with all pertinent state or local radiation standards. Such radiation standards shall be identical to those of the agency having responsibility for control of radiation exposures for the population outside of the plant or its controlled area. All releases of radioactive material to the environment shall be controlled by considering the lot line as the last point at which the user may still exercise control over concentrations. Where possible, exhaust air concentrations should be controlled at the stack or exhaust outlet.

Where no radiation protection codes have been promulgated by an appropriate health agency, the planning or zoning agency should require compliance with the population limits in Title 10, Code of Federal Regulations, Part 20 as of a particular date or the population interim recommendations in National Bureau of Standards Handbook No. 69, on permissible concentrations of radionuclides in air and water. Radiation Protection Guides for certain radionuclides in the environment have also been recommended by the Federal Radiation Council and, in the absence of other regulations for these radionuclides, local planning or zoning ordinances should consider the Radiation Protection Guides as the basis for performance standards.

c. Administrative Appeals

The enforcement and administration of radiation exposure standards for protection of the general public and the environment should be

vested in the health agency having jurisdiction, in accordance with any rules or regulations of that agency. Appeals shall be directed to that health agency for permits to manufacture, utilize, or store radioactive materials or fissionable materials, or use radiation sources of any kind, which may be in excess of those amounts normally permitted for that zoning district. In any case where the health agency determines that the radiation hazard on or beyond any lot line is remote or minimal, even in the event of an accident, the health agency may permit such additional quantity.

Partial List of Suggested References

1. Zimmerman, J.F., "Zoning for Atomic Energy Uses," Zoning Digest, Vol. 16, No. 7, July 1964.

2. "Report on Engineered Safeguards," Press Release No. G-293, by Advisory Committee on Reactor Safeguards, U.S. Atomic Energy Commission, December 17, 1964.

3. Atomic Power Safety, U.S. Atomic Energy Commission, Division of Technical Information, Washington, D.C., June 1964.

4. Beck, C. K., "Engineering Out the Distance Factor, " Press Release No. S-28-63, U.S. A.E.C., September 25, 1963.

5. "Reactor Site Criteria," Title 10, CFR, Part 100, February 11, 1961.

6. J. J. Di Nunno et al, "Calculation of Distance Factors for Power and Test Reactor Sites," TID-14844, U.S. A.E.C., March 23, 1962.

7. Sandbank, Harold, "The Community Impact of Peaceful Applications of Atomic Energy," TID-8202, U.S. A.E.C., March 1960.

8. Siting of Nuclear Power Reactors, Atomic Industrial Forum, New York, New York, August 1959.

9. Criteria for Guidance in the Selection of Sites for the Construction of Reactors and Nuclear Research Center, Proceedings of a Symposium, International Atomic Energy Agency, March 1963.

Appendix to N-2.5.1 - 1965

ASA N-2.5 Zoning Project Report
(July 1964)
Bureau of the Census
S.I. Codes for Atomic Energy Products
(Survey M38Q)

Product	S.I.C. No.	Standard Industrial Classification Code, (Establishments Primarily Engaged in Mfg...)
Nuclear Reactor	3443	Boiler Shop Products Establishments primarily engaged in manufacturing industrial, power and marine boilers, smokestacks, heavy tanks and other boiler shop products; and fabricated plate work which involves the cutting punching, bending and shaping of steel plates for other industries or for assembly on the job.
Reactor Components and Equipment:		
Primary Vessels and Tanks	3443	(see above)
Control Rod Mechanisms and Comp.	3559	Special-Industry Machinery, not elsewhere classified. Establishments primarily engaged in manufacturing special-industry machinery, not elsewhere classified such as
Accessory Instrumentation for Reactor Control	3622	Electrical Appliances
Heat Exchangers and Condensors	3443	(see above)
Pressurizers, Components and Auziliary Equipment	3569	General Industrial Machinery, not elsewhere classified

Product	S.I.C. No.	Standard Industrial Classification Code
Pumps	3561	Pumps, Air and Gas Compressors, and Pumping Equipment
Valves	3494?	Bolts, Nuts, Washers and Rivets
Fuel Handling Equipment	3559	(see above)
Complete Reactor Fuel Elements and Control Rods shipped directly for installation or use in a reactor	2819	Industrial Inorganic Chemicals, not elsewhere classified
Partially Fabricated Reactor Fuel Materials and Control Rods not shipped directly for installation or use in a reactor	2819	(see above)
Core Structurals (Barrels, Cans, Boxes, Plates, etc., not included above)	3443	(see above)
Reactor Moderators, coolants and Reflectors	----	various - however water and liquid metals in 2819 and graphite in 3295 (minerals and earths: ground or otherwise treated)
Other Specialized Reactor Components and Equipment	----	various - depending upon component or equipment
Hot Laboratory Equipment	3811	Laboratory, Scientific and Engineering Instruments (except surgical, medical, and dental)
Shielding	----	various - metal plate: 3443, concrete aggregates: 3295 (see above)

Product	S.I.C. No.	Standard Industrial Classification Code
Radiation Detection and Monitoring Devices	3821	Mechanical Measuring and Controlling Instruments
Radioactive Isotopes Shipped from Plants Producing Isotopes	2819	(see above)
Radiation Sources and other Radioactive Materials Produced from Purchased Isotopes	2819	(see above)
Control and Measuring Devices Containing Radioactive Isotopes	3821	(see above)
Commercial Irradiation Services	----	various - a contract service, code would depend upon the material being irradiated.
Conversion of Enriched Uranium Metal and Components (excluding production of normal and depleted uranium)	2819	(see above)

S.I. Codes for Related Areas, Not Covered in M38Q

X-ray Apparatus	3693	X-ray and Therapeutic Apparatus and Non-Radio Electronic Tubes Establishments primarily engaged in manufacturing electrotherapeutic and electromedical apparatus, X-ray apparatus and tubes, lamps for infra-red and ultra-violet radiation and non-radio electronic tubes.
Drugs and Medicines	283 group	various biologicals, medicinal chemicals and pharmaceuticals.

Product	S.I.C. No.	Standard Industrial Classification Code
Safes and Vaults	3492	Safes and vaults (except concrete grave vaults) vault doors and linings, safe deposit boxes and chests, safe locks.
Graphite	3612	Carbon and Graphite Products for Use in the Electrical Industry
Radium Chloride	2819	(see above)
Radiographic Equipment	3693	(see above)
X-ray Photographic Equipment (except X-ray machines and tubes)	3861	Photographic Equipment and Supplies
Uranium, Radium Ore	1094	Uranium-Radium-Vanadium Ores Establishments primarily engaged in mining, milling or otherwise preparing uranium-radium-vanadium ores, such as uranite (pitchblende), carnotite and roscoelite.
X-ray Laboratories	8071	Medical Laboratories Bacteriological, biological, medical, X-ray, and other laboratories providing professional analytical services to the medical profession. (Therapeutic X-ray are classified in 8011-Offices of Physicians and Surgeons)
Research	8921	Non Profit Educational and Research Agencies

Product	S.I.C. No.	Standard Industrial Classification Code
Electric Light and Power	4911	Electric Light and Power Systems primarily engaged in generation, transmission or distribution of electric energy for sale.

Schedule B, US Bureau of Census, Export Classifications

Nuclear Reactors	-	71250
Any extra parts for nuclear reactors	-	71270
Nuclear Radiation Detection and Measuring Instruments	-	91972
Uranium ores, concentrates and Compounds	-	62510
Uranium metal and alloys, semi-fabricated and fabricated forms (excluding special nuclear material)	-	62530
Thorium ores, concentrates and compounds	-	62550
Thorium metal and alloys, etc.	-	62570
Special Nuclear Material	-	62590
Radium isotopes and isotopes rendered radioactive by irradiation	-	82986